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10/517,674

05/26/2005

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UA.439

1930

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04/11/2008

EXAMINER

DIAO, M BAYE

ART UNIT

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2838

MAIL DATE

DELIVERY MODE

04/11/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|---------------------------------------|--|
| Office Action Summary | Application No. 10/517,674 | Applicant(s) HARTLEY ET AL. | |
| | Examiner M'BAYE DIAO | Art Unit 2838 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 February 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,4, and 7-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,4 and 7-13 is/are rejected.
- 7) ☒ Claim(s) 14-17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 5/26/2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 02/19/2008 has been entered.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1 & 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoon et al., (Yoon) US PAT 6,160,382 in view of Yamamoto et al., (Yamamoto) US PAT 4,360,762.

4. As per claims 1 & 3, Yoon discloses (col. 1, lines 7-14, 66-67; col. 2, lines 1-6, 57-67) and shows in Fig. 4, a method and apparatus for determining characteristics parameters of a storage charge storage device including:

a non-linear equivalent circuit model for the charge storage device (20), thus meeting the limitation of developing an essentialized cell model structure of the electrical device;

the method includes measuring voltage and current characteristics by applying a voltage/current having a predetermined discharge rate to the capacitor (20), thus meeting the limitation of determining models parameters for charge-discharge data of said structure. Yoon also discloses (col. 8, lines 36-48) a voltage/current characteristics measuring means (15) to measure the current and voltage of the charge storage device (20).

Yoon differs from the claimed invention because he does not specifically disclose the determining charge-discharge behavior in a voltage-charge plane. Although Yoon discloses the capacitor (20) (see Yoon reference col. 7, lines 43-49) to be a non-linear device, he did not disclose the characteristics on a voltage charge plane.

Yamamoto discloses (abstract) a non-linear capacitor (3) (applicant's storage device) and shows in Fig. 2A the saturation characteristics of the non-linear capacitor on voltage-charge plane. Yoon further discloses (col. 1, lines 38-57; col. 2,

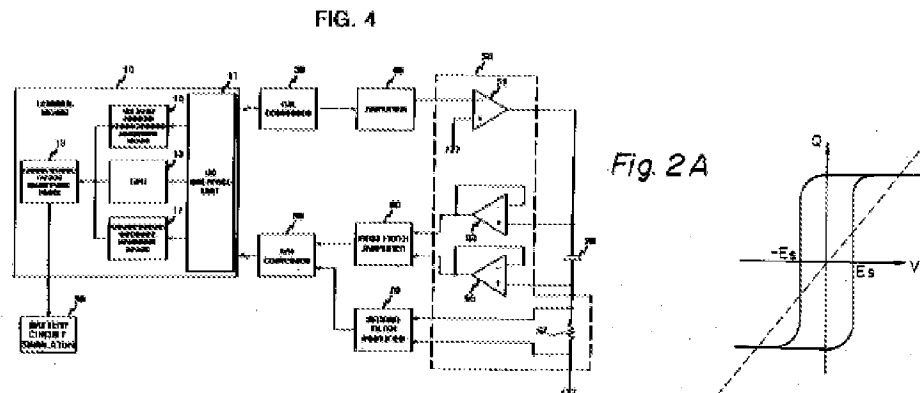
Art Unit: 2838

lines 43-67) that the method includes analyzing the operational characteristics by examining and analyzing the internal parameters related to the mechanism of the storage device as well as average discharge voltage, discharge voltage profile, internal resistance, temperature characteristic and charge cut-off voltage (applicant instantaneous damaged rate), and thus meeting the limitation of, “ the method according to claim 1, further comprising the steps of: developing a charging profile based upon the instantaneous damage rate, wherein said the charging profile optimizes a charging current with respect to. the damage per cycle so as to extend the overall life of the electrical storage device ”.

Yamamoto is evidence that ordinary skill in the art would find a reason, suggestion or motivation to use the characteristics of the non-linearity of the capacitor, charge storing device, such as to understand the saturation and the charging and discharging of the electrical storage device.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Yoon by using the characteristics curve of the non-linearity of the capacitor for advantages such as, understanding the saturation and the charging and discharging of the electrical storage device as per the teachings of Yamamoto.

Accordingly, claims 1 & 3 would have been obvious.



5. Claims 4 & 7 - 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoon et al., (Yoon) US PAT 6,160,382 in view of Garstein et al., (Garstein) US PAT 6,118,248.

6. As per claim 4, Yoon discloses (col. 2, lines 43 - 56; col. 7, lines 11-67; col. 8, lines 1-56) and shows in Fig. 4 above, a method and apparatus for characterizing internal parameters of a charge storage device based on a wide frequency range of impedance measurements and a non-linear equivalent circuit model of the charge storage device comprising:

a control means (10) (applicant's simulation processor) receiving an input signal thru the A/D converter (80) sent to the electrical storage device (20) via the D/A converter (30).

Yoon also discloses that the control means (10) can use a separate voltage/current generator ((53) and (55)) (see col. 7, lines 45 - 49) to charge the storage device (20) directly, so that the voltage/current generator outputs predetermined voltage and current, charging the charge storage device under the control of the control means

(10), thus meeting the limitations of modeling a plurality of states of the electrical storage device and generates an estimated output signal so that the controller mitigates damage of the electrical storage device.

Yoon differs from the claimed invention because he does not specifically disclose that the CPU (13) (applicant's processor) being comprised of a feedback component.

Gartstein discloses (col. 33, lines 41-67) and shows in Figs. 4B, 4C, and Fig. 7, a battery (110,730) (applicant electrical storage device) utilizing an embedded controller circuit (140) (applicant simulation processor) method and apparatus for determining characteristics parameters of a storage charge storage device comprising a charge sub-controller which may optimize the charge of each cell based on actual feedback from that particular cell in order to maximize the number and efficiency. He also discloses (col. 25, lines 59-67) that the pulse-width modulation whose output voltage (applicant's measured output voltage) is continuously sampled and compared to a reference voltage and that the error correction signal is used to alter the duty cycle of the DC/DC converter. He further discloses that the negative feedback loop from the output voltage at the terminals of the electrochemical cell (730) (applicant's storage device) allows the converter (750) to provide a stabilized output voltage and furthermore he discloses (col. 23, lines 50-56) that the battery of the present invention also include a low remaining charge warning to the user.

Yoon also differs from the claimed invention because he does not specifically disclose the control means (10) comprising of a feedback component, which generates a correction signal wherein, said correction signal represents a real time estimate.

Gartstein discloses (col. 13, lines 14-18; col. 14, lines 4-11; col. 26, lines 1-8) that the embedded controller (140) comprising of the discharge sub-controller circuit (102), and/or the charge sub-controller circuit (104) based upon continuously or intermittently sensed operating parameters and/or physical conditions, an emergency disconnect sub-controller circuit (106) whose function is to preferably disconnect the electrochemical cell(s) from the battery terminals when the sensing circuit detects an unsafe condition, and a sensing circuit (105) which may measure operating parameters of the electrochemical cell (130) such as the cell voltage, current drawn from the cell, current etc. He further discloses (col. 14, lines 33-37) that the charge sub-controller (105) minimizes losses by utilizing the instantaneous charge value of the cell(s) and the maximum capacity of the cell to continuously optimize the charging conditions, thus meeting the limitation of said correction signal represents a real time estimate of the amount of damage being done to the electrical storage device during re-charging.

Gartstein further discloses (col. 13, lines 14-28; col. 14, lines 4-11; col. 26, lines 1-8) that the embedded controller (140) comprising of the discharge sub-controller circuit (102), and/or the charge sub-controller circuit (104) based upon continuously or intermittently sensed operating parameters and/or physical conditions (applicant's plurality of modeled dynamic states) of the electric storage device.

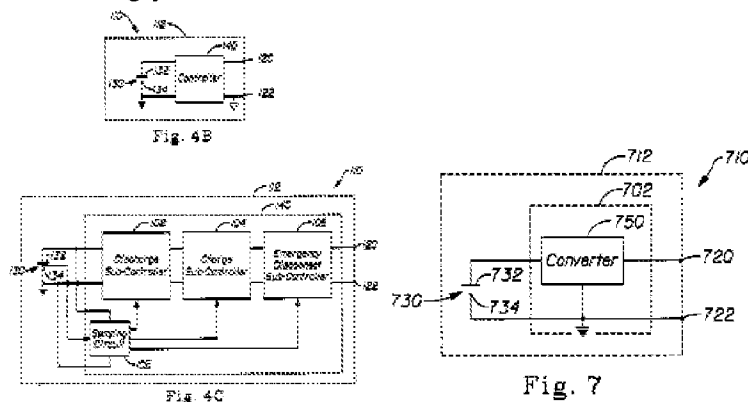
Gartstein is evidence that ordinary skill in the art would find a reason, suggestion or motivation to use the negative feedback loop from the output voltage at the terminals of the electrochemical cell in order to allow the converter to provide a stabilized output voltage and to use the negative feedback loop of the charge sub-controller (105) in

Art Unit: 2838

order to minimize losses by utilizing the instantaneous charge value of the cell(s) and the maximum capacity of the cell to continuously optimize the charging conditions.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Yoon by using the negative feedback loop from the output voltage at the terminals of the electrochemical cell in order to allow the converter to provide a stabilized output voltage and to minimize losses by utilizing the instantaneous charge value of the cell(s) and the maximum capacity of the cell to continuously optimize the charging conditions, as per the teachings of Gartstein.

Accordingly claim 4 would have been obvious.



7. As per claims 7, 9, 10-13, Yoon differs from the claimed invention because he does not specifically disclose that the control means (10) (applicant's controller) receiving a correction signal representing a damage being done to the electrical storage device.

Gartstein discloses (col. 13, lines 57-64) that the charge sub-controller (part of the controller circuit 140) (applicant's controller) safely and efficiently controls the charging of the electrochemical cell(s) (130) (applicant's storage device). He further discloses (col. 13, lines 44-47) that either the discharge sub-controller circuit (102), the

Art Unit: 2838

charge sub-controller (104), or both may perform the function of the emergency disconnect sub-controller (106) as well. He further discloses (col. 13, lines 11-28; col. 14, lines 4-36) that the sensing circuit (105) also measures physical conditions of the electrochemical cell such as temperature, pressure, the hydrogen and/or oxygen concentration, etc, and minimizes losses by utilizing the instantaneous charge value of the cell(s) and the maximum capacity of the cell to continuously optimize the charging conditions.

Gartstein is evidence that ordinary skill in the art would find a reason, suggestion or motivation to use the negative feedback loop of the embedded controller (140), which comprises of the charge sub-controller and sensing circuit (105), the discharge sub-controller (102), and the emergency disconnect sub-controller circuit (106) to optimize the charging conditions.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Yoon by using the embedded controller (140) in order to optimize the charging conditions of the electric storage device as per the teachings of Gartstein.

Accordingly claims 7,9,10-13 would have been obvious.

8. As per claim 8, Yoon differs from the claimed invention because he does not specifically disclose the control means (10) comprising of a feedback loop receiving a feedback signal representing the damage being done. He does not specifically disclose that the voltage-current characterization means (15) generates an output signal such

Art Unit: 2838

that a charging current is applied more during a first half of a charging period than in a second half.

Gartstein discloses (col. 17, lines 1-8) that the battery (10) is designed to extend its service by maintaining the output voltage of the battery at a level greater than or equal to the cut-off voltage of a given device until the sub-controller shuts down when the voltage of the primary electrochemical cells drops below a threshold level, or when a rechargeable electrochemical cell can no longer operate, or when a rechargeable electrochemical cell drops to its optimal discharge depth. He further discloses (col. 25, lines 50-67) that the duty cycle of the DC/DC converter controlled by a pulse-width modulation (PWM) is zero when the converter is off, and 100% when the converter is operating at full. He further discloses (col. 26, lines 19-27) that the DC/DC converter may be turned on only when the cell voltage falls to a predetermined level below which the load can no longer operate (during charge), thus meeting the limitation of a charging current is applied more during a first half than in a second half.

Gartstein is evidence that ordinary skill in the art would find a reason, suggestion or motivation to use the pulse-width modulation of the DC/DC controller such as for control schemes and optimization to control the optimizing parameters of the converter.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Yoon by using the PWM of the converter to control the optimizing parameters of the converter as per the teachings of Gartstein

Accordingly claim 8 would have been obvious.

Allowable Subject Matter

1. Claims 14-17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
2. Claims 14 and 16 recite, inter alia, wherein the step of developing an essentialized cell model structure of the electrical storage device utilizes a hybrid cell model approach thereby permitting to achieve real time observation of the charge state of the storage device.
3. The present art of record does not disclose the above limitations, nor would it be obvious to modify the art of record to include either of the above limitations.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to M'BAYE DIAO whose telephone number is (571)272-6127. The examiner can normally be reached on 8:30-5:00; First Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Akm Ullah can be reached on 571-272-2361. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2838

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Adolf Berhane/
Adolf Berhane
Primary Examiner
Art Unit 2838

/M. D./